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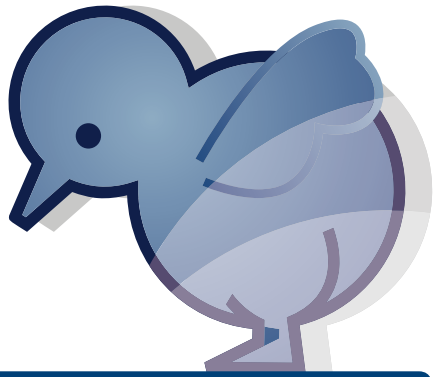
New measurement methods reduce development costs significantly

Developing new components for ventilation systems has always required time-consuming and costly tests of air physical properties during the development phase. Until recently, our measurements of air movements and air velocities required setting up prototypes for lab tests. Every small change made to the prototype required a new or modified prototype – and new measurements.

Simulating air movements and air velocities traditionally involves a large amount of data. The extended availability of powerful PCs and simulation programs has made it much easier and quicker to design and optimise components.

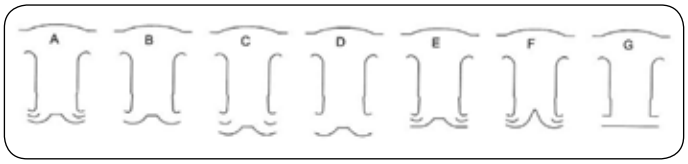
For the development of the DA 50 air supply unit, SKOV A/S and Bjarne Bjerg, associate research professor at The Royal Veterinary and Agricultural University of Copenhagen (KVL), developed a new Computational Fluid Dynamics (CFD) modelling method that allowed us to calculate and demonstrate the behaviour of air movements and air velocities in connection with the air intake.



SKOV
Climate for Growth

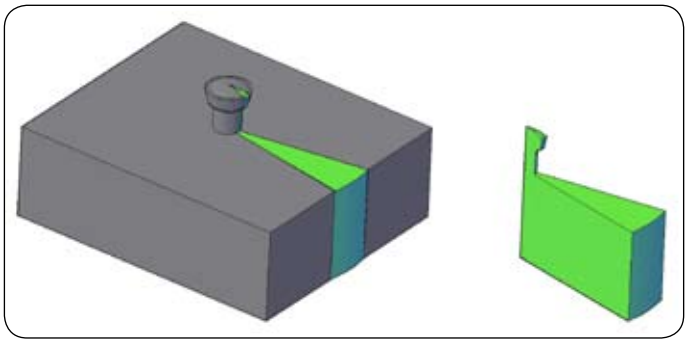
DA 50 – developed by means of CFD.

We started developing the DA 50 air supply unit by modelling the unit in many different designs. We varied the number of air distributing plates as well as the plate designs and angles in order to optimise the unit.



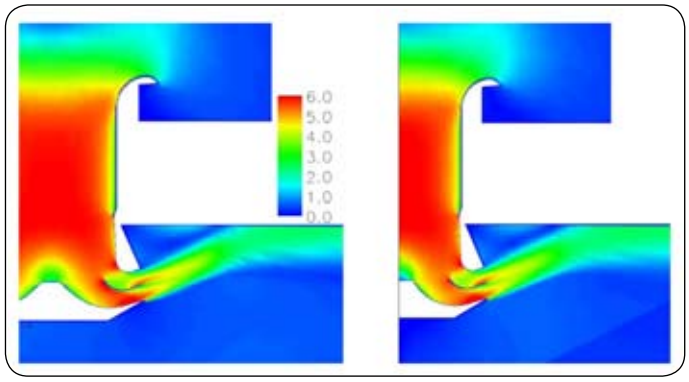
Tests – varying the number and designs of the air distributing plates.

We used the CFD method to test for the optimal design. The new aspect of the CFD model was that we only carried out calculations based on a very limited but well-defined section of the room after which we checked the calculation results to see if they applied to the entire room. During the development of the method, we demonstrated that the results from these sections of the room were just as valid as the calculations made for the entire room.



Entire rum – test of a section of the room.

The advantage of the method was that it enabled us to carry out a number of initial calculations faster for a larger number of units. These units had different characteristics in terms of number and designs of air distributing plates. We could then quickly select the ones that ensured the best air movements and air velocities based on various external factors such as the layout of the building and temperature differences.



Simulated air velocity inside and close to the inlet.

We could then further optimise the DA 50 unit demonstrating the best properties and immediately test whether or not the improvements had the desired effect.

After having found the unit with the best CFD modelling results, we could make a prototype and test it in a real house environment. The CFD modelling process thus enabled us to postpone making and testing a prototype until we were fairly convinced that we had a unit with the proper characteristics.

The CFD modelling process offers several advantages. We reduce the development process costs in that we do not have to make and test different prototypes in a "real" house environment. The test is carried out after the initial selection. We ensure faster introduction of the product because completing a test in CFD takes a lot less time than completing one in a full-scale house environment. Furthermore, we ensure that the products made are optimised to carry out the tasks required of them. Product properties are tailored to meet requirements, so to speak.

CFD modelling processes have been used in various other industries, among others the aviation industry, for many years, but SKOV is the first company to use this technology in the development of ventilation solutions for animal production. The CFD modelling results regarding the DA 50 unit have also attracted attention in the research world and have been presented e.g. at the AgEng conference in Bonn, Germany, where more than 700 agricultural engineers from 55 countries around the world met. The conference was organised by the International Agricultural Engineers Society (CIGR). Furthermore, the work has been recognised and published in the Agricultural Engineering International Ejournal (Vol. X May 2008, Bjarne Bjerg, KVL and Lars C. Sørensen, SKOV A/S)